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13. ABSTRACT (Maximum 200 words)

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A workshop concerned with the integration of data obtained by a number of recently developed imaging method with data obtained by more traditional means was conducted in Carmel Highlands, California, January 5-10, 1992. The thirty-four attendees focused, as a context for considering the challenge of integration, on the degree to which converging information makes it possible to develop models accounting for the effects of distinctiveness on recall, with particular emphasis on models of hippocampal function. Special consideration was given to the relationship between scalp recordings of ERPs and the neuroanatomical information that can be obtained on related processes by MRI, PET, numerical estimation procedures, and the study of focal lesions. The conference paid particular attention to the need to develop a common vocabulary and novel research paradigms if we are to gain the full benefits of current technological innovations.

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Twelfth Annual Carmel Conference

Distinctiveness and Memory: Cognitive Psychophysiological and Physiological Considerations

January 5-10, 1992

Agenda

Sunday, January 5

Afternoon

- | | |
|-------------|--|
| 4:00 - 6:00 | Registration (Fireside Lounge) |
| 8:00 - 9:30 | Opening Session - Emanuel Donchin, University of Illinois,
Urbana-Champaign
<i>"What is distinct about distinctive stimuli?"</i> |

Monday, January 6

- | | |
|------|------------------------------|
| 7:30 | Continental Breakfast |
|------|------------------------------|

Morning Session:

- | | |
|---------------|---|
| 8:30 - 9:30 | Reed Hunt, University of North Carolina
<i>"The concept of distinctiveness in the theory of memory"</i> |
| 9:30 - 10:30 | Art Shimamura, University of California, San Diego
<i>"Memory and the hippocampus: Neuropsychological Perspectives"</i> |
| 10:30 - 11:00 | Coffee Break |
| 11:00 - 12:00 | Neal Cohen, University of Illinois, Urbana-Champaign
<i>"The hippocampus and memory: A neuroscience perspective"</i> |
| 1:00 - 2:30 | Lunch (Yankee Point Room) |

Afternoon Session

- | | |
|-------------|---|
| 2:30 - 3:30 | Sam Deadwyler, Bowman Gray Medical School
<i>"Animal models of P300 and the hippocampus"</i> |
| 3:30 - 4:30 | Robert Knight, VA Medical Center, Martinez, CA
<i>"Lesion studies of P300 and hippocampal function"</i> |

Tuesday, January 7

7:30 Continental Breakfast

Morning Session

8:30 - 9:30 Chris Wood, VA Medical Center, West Haven, CT
"Dipole localization approaches"

9:30 - 10:30 Gregory McCarthy, VA Medical Center, West Haven, CT
"Intracranial recordings in humans"

10:30 - 11:00 Coffee Break

11:00 - 12:00 Patricia Goldman-Rakic, Yale University
"Elucidating the neurophysiological mechanisms underlying memory"

1:00 - 3:00 Lunch at Point Lobos (weather permitting)

Afternoon Session

At this point the meeting breaks into four panels, each of which is given a specific charge. The panels meet for the remainder of Tuesday as well as for the entire day of Wednesday, January 8. The panels are arranged so that the different orientations represented in the meeting participate in each of the panels.

Wednesday, January 8

The entire day is devoted to the meetings of the panels. Meeting times will be scheduled by the panel chairmen.

7:30 Conference Banquet

Thursday, January 9

7:30 Continental Breakfast

Morning Session

9:00 - 12:00 Report of Panel I: Paradigms for the Study of Memory

12:30 Lunch (Yankee Point Room)

Agenda

3

Afternoon Session

2:00 - 5:00 Report of Panel II: Novelty, Distinctiveness and Memory

Friday, January 10

7:30 Continental Breakfast

Morning Session

8:30 - 11:30 Report of Panel III: The Blind Men and the Elephant

11:45 Lunch (Yankee Point Room)

Afternoon Session

1:00 - 4:00 Report of Panel IV: Cognitive Neuroscience and Theories of Hippocampal Function

4:15 Adjournment

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Twelfth Annual Carmel Conference

Distinctiveness and Memory: Cognitive Psychophysiological and Physiological Considerations

January 5-10, 1992

Charge to Panels

Introduction

Following are the tentative descriptions of the assignments of our four panels. The list of participants assigned to each panel is included. As I have said on all previous occasions, I am neither naive, nor presumptuous, enough to assume that this groups of strong-willed individuals will, or should, follow my directions. I hope the groups will feel free to diverge from these guidelines wherever the discussion leads.

The times allotted to the panel meetings are the afternoon of Tuesday, January 7th, and all day Wednesday, January 8th. Rooms have been set aside for the purpose. The panelists, however, are in full control of their schedule and can meet at any other time. If the need arises let me, or Alfreda Mitchell, know and we shall arrange rooms at other than the scheduled times. Needless to say, you are free to meet at any other place of your convenience.

The panel coordinators, whose names are underlined in the panel membership lists will chair the panel meetings and the session of the workshop at which the panel's report will be presented. An important rule in these meetings has been that participants accept their panel assignments. It is inevitable that some may find another panel more interesting than the one to which they have been assigned. We have to abide, nevertheless, by the present distribution. The arrangement of the panels is quite complex and it must satisfy a number of complex design criteria. It would be very difficult to make changes without substantial disruption.

Each panel has been assigned a subset of the issues to be addressed by the Workshop. There is an inevitable overlap. I have tried to use these "charges" to circumscribe the domains. All four panels will, I hope, recall that in this conference we are examining the very substantive ensemble of issues that arise in an attempt to model memory processes in a manner that would accommodate diverse bodies of data ranging from data about the effects of hippocampal lesions to the performance on memory tests, to data about the effects of novelty on recall. At the same time, we have a strong methodological interest. We need to examine the wide variety of functional imaging tools that have been brought to bear on these, and on related, issues. We are narrowing the focus of our substantive concerns with the hope that this strategy will help clarify the domains of utility for these different approaches and will help identify how we can communicate across the constraints established by our respective methodologies. Each of the panels is asked to adopt this dual perspective - addressing both methodological and substantive questions.

Panel I: Paradigms for the Study of Memory

Cohen, Coles, Fabiani, Lewine, Paller, Ritter, Smith, Swick

Upon close examination it is evident that those of us who claim to study "Memory" do actually use many different paradigms, challenging our subjects in different ways and obtaining data that may or may not address the "same" set of phenomena. The dependence of the view we have of "memory" on the method of testing has been well known at least since Ebbinghaus. One reason for examining this diversity in the present workshop is that there seems to be a correlation between the measures of brain function we use and the memory paradigms we find congenial. To some extent the correlation between measures and memory test is driven by substantive interests. To some extent the correlation is driven by the mechanics of our measurement processes. Thus, for example, ERPs can only be measured with respect to events whose time of occurrence is known. This fact has a lot to do with the sort of stimuli used in the field and the kind of paradigms preferred. Similarly, people who work primarily with the brain damaged amnesic are naturally drawn to an interest, a very justified interest, in implicit memory paradigms. The need to integrate measurements over a 40 second period no doubt shapes the experiments conducted by users of PET machines. The need to use many sessions to obtain a full MEG map, no doubt constraints the choices made by its practitioners.

It would be useful if the panel could examine the extent to which there is indeed such a mapping of memory-testing paradigms on different approaches to Cognitive Neuroscience. Of interest, then, would be the degree to which this mapping affects the theoretical predilections, and models, which dominate within subsegments of our general area of interest. It would be useful to know the extent to which integration is hampered because seemingly identical concepts and terms are used differently in studies using different approaches to functional imaging, and the differences are driven by paradigmatic predilections that are actually driven by methodological considerations. Of course, to the extent that the panel identifies problems, we would all be grateful if solutions are proposed. How can we integrate our various approaches? How can we generalize across paradigms? To what extent do the memory models developed in one domain take into account the findings that emerge in other areas.

Panel II: Novelty, Distinctiveness and Memory

Donchin, Goldman-Rakic, Halgren, Hunt, McCarley, Metcalfe, Pineda,
Van Petten

This panel is asked to examine the variety of empirical reports, and conceptual models, that lead, in one way, or the other to a class of assertions that "distinctive items are better remembered." I do not need to enumerate here the very many ways in which this assertion has received empirical support. What is entirely unclear, as Schmidt has shown in a recent review, whether all of the operations that somehow lead to "distinctiveness" or "novelty" and can be shown to enhance recall, recognition, or even implicit memory effects, are or are not "distinct" themselves. Are data obtained in a Von Restorff study relevantly related to data obtained in studies of Distinctiveness conducted within the framework of a Level of Processing study? How are these data in turn related to studies of the effect of Distinctive Stimuli in studies of animal learning? Furthermore, are the studies of the effects of novelty on the hippocampus relevant to this body of literature?

Of course, in keeping with our interest in the methodology of functional brain imaging this panel should consider the role of novelty and distinctiveness as they affect various measures of brain function, and in particular various ERP components. How does rarity in the odd ball paradigm relate to novelty and distinctiveness? And what of the various claims that there are relationships between various ERP components and subsequent memory for the eliciting stimuli? Can these data be interpreted within the context of the paradigms of the experimental psychologist on the one hand and the data on the sensitivity of various brain structures, and in particular the hippocampus, to novelty?

In the main, this panel's task is to set the stage for the discussion of the two panels which are examining the sources of ERP components and of the functional significance of brain structures in the establishment, retrieval and maintenance of memory traces. We need to have a consensual integration of the behavioral and the electrophysiological views of the role of distinctiveness in memory so that we can interpret the functional significance of the neural structures which implement the relevant processing and at the same time manifest themselves on the scalp in the form of ERP components.

Panel III: The Blind Persons and the Elephant: The Search for the Intracranial Correspondents of Surface Recordings

Gabriel, Gehring, Hampson, Hillyard, Polich, Snyder, Wilson, Wood

This panel's charge assumes that we have agreed that a small number of surface measures of brain function (e.g., ERPs, MEGs) are sensitive to manipulations of novelty, distinctiveness and incongruity. It is also assumed that there is also some indication that these components show interesting relationships to "memory." With these assumptions in mind the panel is asked to review what, if anything, can be asserted about the intracranial origins of these surface recordings. This is not an easy question because even the enumeration of the relevant components will not be an easy matter as there are some serious controversies regarding, for example, the degree to which it is P300 that carries the effects which predict subsequent recall of distinctive items. Similar debates exist with respect to most other components. Even if this issue is ignored and one is willing to consider the specific task of locating the generating sources of the components in question controversy abounds, despite a considerable amount of good data that were made available in the last decade.

Is there really a conflict between the picture that emerges from intracranial recordings and that emerging from studies of lesioned subjects from various species, including humans? Can we integrate the claims regarding the origin of P300, for example, that emerged from studies of rats, cats, primates and humans? What criteria do we use to relate intracranial recordings to surface recordings? Is temporal contiguity sufficient? Do we need to require a detailed model of propagation? How do we distinguish between "source" in the sense of the specific dipole whose field is recorded on the scalp and a "source" in the sense of "a structure involved in the circuit critical to the appearance of the component?"

It will, of course, be very useful if the Panel can chart for us a course through these various controversies so we can know what assertions can be safely made about the surface recordings and the processes they manifest. It seems clear that the degree to which the psychophysiological, and behavioral, data can contribute to Cognitive Neuroscience depends on the extent to which these data can be anchored in solid anatomical specifications. It is this panel's task to tell us how far, or near, are we to this goal and what needs to be done to reduce the distance.

Panel IV: Cognitive Neuroscience and Theories of Hippocampal Function

Deadwyler, Gratton, Heffley, Knight, McCarthy, Nielsen-Bohlman, Prichard,
Shimamura

This panel appears to be treading the most solid ground, compared to the other panels. There is clearly an enormous amount of data on the role of the hippocampus in general and on the specific involvement of hippocampal function in memory. Many investigations, over a substantial number of years, have yielded a massive data base which appears, at least to an outsider, to be impressively coherent, (this, of course, is a relative statement). Yet, there are many an inconsistency. Competing models have been presented. Some of the diversity is generated by differences in paradigms. The effect of hippocampal lesions on the behavior of rats in a radial maze may, or may not, be related to absence of short term memory in H.M. What we are asking this panel to do is to (a) identify for us, and summarize, the dominant approaches to the role of the hippocampus in memory function, (b) enumerate the major, unresolved, theoretical issues in this field and, most important for this meeting, (c) identify those issues to whose resolution we might add by using the data of Cognitive Neuroscience, with particular emphasis on methods of functional brain imaging.

Twelfth Annual Carmel Conference

Distinctiveness and Memory: Cognitive Psychophysiological and Physiological Considerations

January 5-10, 1992

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